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EPA Superfund
Explanation of Significant Differences:

SAN FERNANDO VALLEY (AREA 1)
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NORTH HOLLYWOOD, CA
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San Fernando Valley Superfund Site
Burbank Operable Unit

Second Explanation of Significant Differences
to the
Record of Decision

United States Environmental Protection Agency
Region IX - San Francisco, CA
February 12, 1997

< IMG SRC 97037B>

SECOND
EXPLANATION OF SIGNIFICANT DIFFERENCES
DECLARATION

SITE NAME AND LOCATION

San Fernando Valley Area 1
Burbank Operable Unit
Los Angeles County, California

I. Statement of Basis and Purpose

This decision document presents the Second Explanation of Significant Differences (ESD2) to the interim remedial action selected by the Burbank Operable Unit (Burbank OU) Record of Decision (ROD) signed June 1989. The Burbank OU ROD was previously modified by an Explanation of Significant Differences dated November 1990 (ESD1). Additional changes to the remedy were made in a 1992 Consent Decree, which was approved by the Central District of California federal court. ESD2 has been developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. Section 9601 et. seq.) and the National Contingency Plan (40 C.F.R. Section 300 et. seq.).

II. Description of the Selected Remedy in the ROD in the ROD and ESD1

The Burbank OU ROD selected the interim remedy for an area of groundwater contamination, located within the San Fernando Valley Area 1 Superfund Site, which encompasses wellfields which were operated by the City of Burbank prior to being shut down as a result of the contamination. The ROD selected extraction of contaminated groundwater, treatment by air or steam stripping, and use of the treated water as a public water supply by the City of Burbank. The interim remedy was estimated to cost $69 million over 20 years (in 1989 dollars).

The ROD selected as the interim remedy the extraction and treatment of groundwater at a rate of 12,000 gallons per minute (gpm). This was considered to be the extraction rate necessary to hydraulically control, i.e. to prevent the spreading of, groundwater at concentrations of 100 parts per billion (ppb) of trichloroethylene (TCE) and 5 ppb of perchloroethylene (PCE). Extraction wells were to be placed in locations which would control plume migration while initiating aquifer restoration. The treatment technology specified was either air stripping or steam stripping, with off-gas control.

The ROD states that the treated water must meet all existing federal and state Maximum Contaminant Levels (MCLs) and State Action Levels (SALs). It also states that the water must meet all drinking water treatment technology requirements. The ROD states a preference for delivering the treated water to the City of Burbank's distribution system for use as a public water supply. Using the treated water in this manner was considered preferable a discharging the water to waste because it represents a beneficial use of the groundwater resource in a water-poor region.

III. Summary of ESD1

ESD1 clarified and superseded certain parts of the Burbank OU ROD, as follows.

Based on new information regarding the occurrence of nitrate in the groundwater (nitrate levels turned out to be higher than anticipated), it became clear that additional treatment measures would be required in order for the extracted and treated groundwater to be used as a public water supply. EPA decided to require blending of the extracted and treated Burbank OU groundwater with a water supply lower in nitrates, such that the MCL is achieved in water served to the public.

The nitrate blending requirement increased the total amount of water produced by the interim remedy. The total amount to be produced was high enough that the possibility was raised that the City of Burbank would not be able to accept the total quantity of water produced at the Burbank OU. Other local water purveyors were unwilling to commit to accept excess water produced by the Burbank OU treatment plant. Therefore, in order to ensure that the interim remedy would

continue to extract contaminated groundwater at the intended capacity, EPA decided to require reinjection of any excess water.

EPA clarified that the interim remedy could be designed, constructed, and operated in phases. Phasing the project allows for initial completion of a portion of the total extraction wellfield and treatment plant capacity. Operation of this first phase of the project allows collection of data on aquifer response and treatment plant efficiency. This data helps the design engineer ro optimize the design of the following project phases, and helps to optimize overall groundwater containment and treatment efficiency for the project.

EPA clarified statements in the ROD pertaining to containment of groundwater containing TCE at 100 ppb and PCE at 5 ppb. These levels are not treatment goals to be attained in groundwater, but are to be used in designing the containment area to be developed by the extraction wellfield.

Because of the addition of reinjection as a component of the project, ARARs pertaining to reinjection of extracted and treated groundwater were identified. Specifically mentioned was the "Statement of Policy with Respect to Maintaining High Quality of Waters in California," which requires that reinjected water not degrade existing water quality.

The additional cost due to ESD1 changes in the interim remedy were estimated at $8.8 million over 20 years (in 1990 dollars).

IV. Summary of Additional Significant Differences (ESD2)

Based on additional study of the local (Burbank OU) groundwater system by Lockheed Martin, and by EPA's consultant CH2M Hill, EPA has concluded that an extraction rate of 9,000 gpm results in substantially the same level of groundwater containment as an extraction rate of 12,000 gpm. Overall costs are reduced at the lower extraction rate, because the need to construct and operate expensive reinjection facilities is eliminated. Cost effectiveness is improved because the lower extraction rate makes it less likely that the upper groundwater zone will become dewatered, and thus will allow EPA to achieve its goal of preferentially pumping the most contaminated zones. Based on these factors, EPA has lowered the interim remedy extraction rate to 9,000 gpm.

EPA has decided to eliminate reinjection as a requirement based on projections that there will essentially be no excess water at the revised groundwater extraction rate. The City of Burbank can substantially accept and has committed to accept, an average of 9,000 gpm from the interim remedy facilities.

Due to elimination of reinjection from the project, the Burbank OU groundwater extraction rate will not be a continuous 9,000 gpm. The instantaneous extraction rate will fluctuate with the City of Burbank's water demand. In recognition of the likelihood that it will not be possible to extract groundwater at a rate of 9,000 gpm, twenty-four hours a day, three hundred and sixty-five days a year, EPA is specifying that the new extraction rate will be achieved as an average rate, not an instantaneous rate.

EPA has also decided to suspend the 9,000 gpm extraction rate requirement during times when nitrate levels in the extracted groundwater exceed 50 mg/1 as nitrate. The ability to maintain an annual extraction rate Of 9,000 gpm is not only dependent on the City of Burbank's water demand, but also upon nitrate concentrations in the extracted groundwater. It is possible that these concentrations may rise high enough such that, during periods of low water demand, it is not possible to extract an average of 9,000 gpm and also meet the nitrate MCL. EPA's analysis suggests chat even under the worst case scenario for nitrates, an average of 8,500 gpm would be pumped. EPA believes the interim remedy will continue to be protective of human health and the environment even at this slightly reduced groundwater extraction rate, if it occurs, will only occur on an occasional basis.

EPA estimates that changes to the interim remedy effected by ESD2 will reduce implementation costs by $49 million (1995 dollars).

Further, the City of Burbank holds a public water supply operating permit, issued by the California Department of Health Services. This permit has been amended to cover operation of the

Burbank OU treatment facilities. The requirements of this permit will govern off-site requirements for drinking water protectiveness.

V. Declaration

The selected remedy, as modified by this ESD, is protective of human health and the environment, attains federal and state requirements that are applicable, or relevant and appropriate, to this interim remedial action, and is cost-effective. This remedy satisfies the statutory preference for remedies that employ treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances as a principal element. It also complies with the statutory preference for remedies that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. As part of the remedy, groundwater monitoring will be conducted to track contaminant levels at the Burbank Operable Unit and to monitor the performance of the extraction and treatment system in order to ensure adequate protection of human health and the environment.

<IMG SRC 97037C>

San Fernando Valley Area 1, Burbank Operable Unit

SECOND EXPLANATION OF SIGNIFICANT DIFFERENCES
February 12, 1997

I. Introduction

On June 30, 1989, the U.S. Environmental Protection Agency (EPA) signed a Record of Decision (ROD) for the San Fernando Valley Area 1 Superfund Site, Burbank Operable Unit (Burbank OU). On November 21, 1990 , EPA signed an Explanation of Significant Differences (ESD1) modifying the interim remedial action selected in the ROD. The purpose of this Second Explanation of Significant Differences (ESD2) is to explain additional modifications to the interim remedial action.

Under Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendment and Reauthorization Act of 1986, and pursuant to 40 C.F.R. Sec. 300.435 (c) (2) (i) Fed. Reg. 8666, 8852 (March 8, 1990)), EPA is required to publish an Explanation of Significant Differences when significant (but not fundamental) changes are made to a final remedial action plan as described in a ROD.

This document provides a brief background of the Site, a summary of the remedy selected in the Burbank OU ROD, a summary of changes made to the remedy by ESD1, a description of the changes to the remedy EPA is making in this ESD2 (including how the changes affect and better refine the remedy selected in the ROD) and an explanation of why EPA is making these changes.

EPA is issuing ESD2 in order to take into account technical data received after ESD1 was signed in November, 1990. The changes are: (1) Based on additional study of the local (Burbank OU) groundwater system, EPA has concluded that an extraction rate of 9,000 gallons per minute (gpm) results in substantially the same level of groundwater containment as an extraction rate of 12,000 gpm. Therefore, the interim remedy extraction rate has been reduced to 9,000 gpm; (2) EPA is specifying that the new extraction rate will be achieved as an average rate, not an instantaneous rate; (3) EPA has decided to eliminate reinjection as a requirement based on projection that, on an annual basis, there will be excess water at the revised groundwater extraction rate; and (4) EPA has decided that the specified average extraction rate need not be met during times when nitrate levels in the extracted groundwater exceed 50 mg/l, because under this circumstance a greater quantity of blending water will be required, leaving the City of Burbank less capacity to accept extracted groundwater for use as a public water supply.

ESD2 and the supporting documentation will become part of the Burbank OU Administrative Record. Copies of the Administrative Record have been placed at the following locations:

City of Burbank Public Library
110 North Glenoaks Boulevard
Burbank, CA 91502
818-953-9737

City of Glendale Public Library
222 East Harvard Street
Glendale, CA 91205
818-956-2027

II. Background

A. Site background and description

The following gives a brief background of the Burbank OU and a short summary of the remedy selected in the ROD and modified by ESD1. Further background information can be found in the ROD (dated June 30, 1989), and in ESD1 (dated November 20, 1990), as well as in other documents in the Burbank OU Administrative Record.

In June 1986, EPA evaluated the threat posed by groundwater contamination at a number of water supply wellfields within the San Fernando Valley and Verdugo groundwater basins. The chief contaminants of concern are trichloroethylene (TCE) and perchloroethylene (PCE). As a result of

its investigation, EPA designated four wellfield areas as National Priorities List (NPL) site. EPA is managing the four sites as a single project consistent with CERCLA Section 104(d)(4).

The San Fernando Valley Groundwater Basin has historically been an important source of drinking water for the Los Angeles metropolitan area, including the City of Burbank. The groundwater basin provides enough water to serve approximately 600,000 residents.

Groundwater extracted from the basin is especially important during years of drought. Due to contamination by volatile organic chemicals (VOCs), including TCE and PCE, beneficial use of the groundwater resource has been partially lost. Surface water supplies have replaced the lost resource, but are costly, and may not be available in the future due to periodic drought conditions and the potential for changing water rights policy.

The Burbank OU is located within the San Fernando Valley groundwater basin and encompasses wellfields which were operated by the City of Burbank prior to being shut down as a result of contamination. The Burbank OU was specifically developed to address this areal extent of groundwater contamination.

The City of Burbank's production wells have been shut down since the early 1980s because of the presence of TCE and PCE in concentrations exceeding federal and state Maximum Contaminant Levels (MCLs). Consequently, the city purchases close to one hundred percent of its water from the Metropolitan Water District of Southern California, which supplies surface water imported from outside the San Fernando basin. (The city does operate a granular activated carbon groundwater extraction and treatment plant during parts of the year, but the contribution of this plant toward meeting the overall water demand is small.)

B. Selected remedy as modified by ESD1

The Burbank OU ROD selected the interim remedy for an area of groundwater contamination generally located within the San Fernando Valley Area 1 Superfund Site. The ROD selected extraction of contaminated groundwater, treatment by air or steam stripping, and use of the treated water as a public water supply by the City of Burbank. The interim remedy was estimated to cost $69 million over the 20 year planned length of the interim remedy. ESD1 added the requirement to blend the extracted, treated, water with a lower nitrate source in order to meet nitrate MCLs. ESD1 also added the requirement for reinjection of excess water that the city could not accept due to water demand limitations. The changes to the interim remedy caused by ESD1 were estimated to cost $8.8 million, raising the total estimated project cost to $77.8 million (in 1989/1990 dollars).

Based on analyses conducted by the Los Angeles Department of Water and Power through their consultant James M. Montgomery, in the Burbank OU Feasibility Study, the ROD specified that groundwater would be extracted and treated at a rate of 12,000 gpm. This rate was considered necessary in order to control plume migration and to initiate aquifer restoration. The 12,000 gpm rate was projected to hydraulically contain groundwater having a concentration of 100 parts per billion (ppb) of TCE and 5 ppb of PCE. ESD1 clarified that these levels are not treatment goals to be attained in groundwater, but are to be used in designing the containment area to be developed by the extraction wellfield.

The ROD states that the water must meet all existing federal and state MCLS and State Action Levels (SALS). It also states that the water must meet all drinking water treatment technology requirements. The treated water is being delivered to the City of Burbank's distribution system for use as a public water supply. Use of the treated water in this manner is considered preferable to discharging the water to waste because it restores the groundwater resource to beneficial use.

With respect to meeting drinking water standards, ESD1 concluded that, based on new information suggesting high nitrate levels in the groundwater, additional measures were required to meet the MCL for nitrate in the extracted and treated water. EPA decided to require blending of the extracted and treated groundwater with a water supply lower in nitrates, such that the MCL is achieved in water served to the public.

Addition of the nitrate blending requirement raised the possibility that the City of Burbank would not be able to accept the total of water produced by the interim remedy. This is because

nitrate blending raises water production, from the initially anticipated rate of 12,000 gpm, to a rate as high as 24,000 gpm. Under ESD1, EPA decided to require reinjection of any excess water, or water the City of Burbank could not use as a public water supply due to insufficient demand. EPA also identified Applicable or Relevant and Appropriate Requirements (ARARs) pertaining to reinjection of extracted and treated groundwater, specifically, the "Statement of Policy with Respect to Maintaining High Quality of Waters in California," which requires that reinjected water not degrade existing water quality.

Under ESD1, EPA also clarified that the interim remedy could be designed, constructed, and operated in phases. Phasing the project allows for initial completion of a portion of the total extraction wellfield and capacity treatment plant capacity. Operation of this first phase of the project allows collection of data on aquifer response and treatment plant efficiency. This data helps the design engineer to optimize the design of the following project phases, and helps to optimize overall groundwater containment and treatment efficiency for the project.

Portions of the Burbank OU ROD and ESD1 have already been implemented through a 1992 Consent Decree and a Unilateral Administrative Order. EPA also made additional operational changes in the interim remedy in the 1992 consent decree, which was approved by the Central District of California federal court. The 1992 consent decree, captioned United States of America v. Lockheed Corporation et al., Civil Action No. 91-4527 MRP (Tx), is included in the Administrative Record.

Under the Consent Decree, Lockheed Martin and the City of Burbank have constructed the first phase of the interim remedy. Under the Unilateral Administrative order, a group of parties associated with six other Burbank facilities have constructed the blending facility, the purpose of which is to reduce nitrates in the extracted, treated groundwater. The first phase of the interim remedy was completed and became operational in January 1996. The first phase consists of groundwater extraction and treatment at a rate of 6,000 gpm, blending with Metropolitan Water District water, and use of the treated, blended water as a public water supply.

III. Summary of Significant Differences

ESD2 provides the following changes to the interim remedy:

1) EPA has lowered the interim remedy extraction rate to 9,000 gpm. Based on additional study of the local (Burbank OU) groundwater system during the Remedial Design phase, EPA has concluded that an extraction rate of 9,000 gpm results in substantially the same level of groundwater containment as an extraction rate of 12,000 gpm. Cost effectiveness is improved at the lower extraction rate, not only due to the reduced cost of pumping less water; but because the need to construct and operate expensive reinjection facilities is eliminated. In addition, the lower extraction rate makes it less likely that the upper groundwater zone will become de-watered, and thus will allow EPA to achieve its goal of preferentially pumping the most contaminated zones.

2) EPA has decided to eliminate reinjection as a requirement. This decision is based on projections that, under existing aquifer conditions, there will be no excess water (i.e. water that cannot be used by the City of Burbank as a public water supply) produced at the revised groundwater extraction rate. The City of Burbank has committed to accept an annual average of 9,000 gpm from the interim remedy facilities.

3) EPA is specifying that the 9,000 gpm extraction rate will be achieved as an average rate, not as an instantaneous rate. Due to elimination of reinjection, the instantaneous rate will fluctuate with the City of Burbank's water demand. EPA recognizes that it will not be possible to extract groundwater at a rate of 9,000 gpm, twenty-four hours a day, three hundred and sixty-five days a year. However, EPA's analysis suggests that under the worst scenario for nitrates, groundwater can be extracted at a minimum rate of 8,500 gpm. EPA believes protectiveness of human health and the environment is maintained even at this slightly reduced rate, which, if necessary, will only be necessary on an occasional basis. In order to maximize the amount of groundwater pumped, EPA has decided to count groundwater extraction from the city's granular activated carbon treatment plant toward the 9,000 gpm average rate. This wellfield will most likely be used by the city during the summer to meet peak water demand. The City of Burbank has agreed to maximize its use of treated groundwater. These decisions and agreements are to be included in a second consent decree between EPA, the city, and numerous Burbank parties.

4) EPA has decided to suspend the 9,000 gpm extraction rate requirements during times when nitrate levels in the extracted groundwater exceed 50 mg/l as nitrate. This decision is being made to ensure that under no circumstances will the MCL for nitrate be exceeded in the treated water. The ability to maintain an annual extraction rate of 9,000 gpm is not only dependent on the Burbank's water demand, but also upon nitrate concentrations the extracted groundwater and in the blending water. It is possible that these concentrations may rise high enough such that, during periods of low water demand, it is not possible to extract an average of 9,000 gpm and also meet the nitrate MCL. However, as mentioned in the above paragraph, the city of Burbank has agreed to maximize its use of treated groundwater.

Lockheed Martin has estimated that changes to the interim remedy effected by ESD2 will reduce implementation costs by 49 million dollars (1995 dollars), and EPA is in agreement with this estimate.

IV. Explanation and Detailed Description of Changes and Clarifications

After the ROD and ESD1 were signed, EPA received and reviewed new data from its Alternative Remedial Contracting Strategy (ARCS) contractor CH2M Hill, from the City of Burbank, and from the Lockheed Martin Corporation, regarding the Burbank OU groundwater system. This new information included both data collected in the field (from groundwater monitoring wells) and the output from computer modeling exercises. Reports and technical memoranda were generated compiling this data, which project that the implementation of ESD2 will not reduce the protectiveness of the Burbank OU interim remedy. Thus, EPA's conclusion in the ROD and ESD1 that the interim remedy is protective of human health and the environment nas not changed. The new and existing technical information that EPA relied upon to prepare ESD2 is identified in the discussion which follows, and this information can be found in the Burbank OU Administrative Record.

A. Background

Based on this new information, EPA has concluded that a lower pumping rate than originally projected will result in the desired decree of containment of the VOC contaminant plume in the vicinity of the Burbank OU. This projection results from an improved ability on EPA's part to predict aquifer response to pumping, made possible because real operating data is now available from Phase 1 of the Burbank OU interim remedy, which includes a 6,000 gpm groundwater extraction wellfield. In addition, the local groundwater flow models designed by CH2M Hill and by Lockheed Martin have undergone additional improvement and verification since the ROD was written. Results from both models predict that a 9,000 gpm extraction rate achieves the goals of the ROD.

EPA believes it is important to implement this change not only because it is based on sound scientific analysis, but also because of cost savings to the project. Reducing the pumping rate allows elimination of costly reinjection facilities required under ESD1. The lower pumping rate also ensures that EPA will be able to pump from the most contaminated zones of the aquifer without dewatering the aquifer.

EPA, with the assistance of CH2M Hill, the City of Burbank, and Lockheed Martin, performed the following analysis in reaching these conclusion.

B. Options

While CERCLA Section 117 (c) and 40 C. F. R. Section 300.435(c)(2)(i) merely require an explanation of significant differences and the reason for these differences, ESD2 sets out in detail four options regarding the rate of groundwater extraction, along with EPA's analysis of these options. The four options are as follows:

1. Extraction and treatment of an annual average of 6,000 gpm of groundwater from the existing Phase 1 Burbank OU wellfield, with use of the treated water by the City of Burbank (this phase of the project is currently in operation; therefore, if option 1 were selected, no further construction would be required at the Burbank OU);

2. Extraction and treatment of an annual average of 9,000 gpm of groundwater from the existing Phase 1 Burbank OU wellfield, and the planned Phase 2 wellfield, with use of the treated water

by the City of Burbank;

3. Extraction and treatment of an annual average of 12,000 gpm of groundwater from the existing Phase 1 and proposed Phase 2 and Phase 3 Burbank OU wellfields, with use of the treated water by the City of Burbank, with conveyance of excess water to other purveyors;

4. Extraction and treatment of an annual average of 12,000 gpm of groundwater from the existing Phase 1 and proposed Phase 2 and Phase 3 Burbank OU wellfields, with use of the treated water by the City of Burbank, and reinjection of excess water (this is the option selected by the ROD as modified by ESD1).

C. Analysis of options

The four options presented above were compared with each other based on the nine criteria listed and explained in the National Contingency Plan (NCP), 40 C.F.R. Section 300.430(e)(9)(iii). The nine criteria and the results of the comparison of the options are presented in this subsection. The nine criteria are as follows:

1. compliance with ARARs
2. overall protection of human health and the environment
3. short-term effectiveness in protecting human health and the environment
4. long-term effectiveness and permanence in protecting human health and the environment
5. reduction of toxicity, mobility, and Volume of contaminants
6. technical and administrative feasibility of implementation
7. capital and operation and maintenance costs
8. state acceptance
9. community acceptance

An analysis of the four options in terms of the above criteria follows.

1. Compliance with ARARs

The Burbank OU ROD recognizes that chemical-specific ARARs for the groundwater itself will be addressed in the final remedy. The remedial action adopted pursuant to the ROD, ESD1, and ESD2, is an interim action; therefore, chemical-specific ARARs for the groundwater contaminant plume do not apply to the activities taken pursuant to the ROD, ESD1, and ESD2.

However for each of the four options being considered, drinking water standards, including state and federal MCLs, source water monitoring protocols, and treatment technology requirements, must be met. The existing treatment plant designed under Phase 1 has been shown to meet these standards during operation at flows up to 6,000 gpm. Option 1 is essentially Phase 1 of the Burbank OU interim remedy, which EPA has previously concluded meets drinking water ARARs.

The Phase 1 Burbank OU treatment plant is currently being operate to meet all standard state drinking water requirements and several special conditions, as specified in the public water supply operating permit issued to the City of Burbank by the California Department of Health Services (DHS). Since the treatment plant was designed with excess capacity, and can produce up to 9,000 gpm with no loss in treatment efficiency, EPA is confident that Option 2 will also meet drinking water ARARs. Options 3 and 4 would require modification to the treatment plant, but EPA is also confident that such modifications could be performed such that these standards would be met.

The treatment standards applicable to the Burbank OU treatment system were initially established in the ROD. The ROD required that the treatment system meet MCLs for all constituents (other than nitrates). Because water from the Burbank OU treatment system is covered offsite for use as a public water supply, and applicable drinking water standards may change, the consent decrees governing operation of the treatment plant recognize that EPA may identify requirements promulgated after the date of the ROD as ARARs in accordance with section 300.430 (f)(1)(ii)(B)(1) of the NCP. That section requires attaining (or waiving) requirements promulgated after the date of the ROD where necessary to protect human health or the environment. This ESD does not change the treatment standards for operation of the treatment plant.

With respect to groundwater reinjection, ARARs include the California Regional Water Quality Control Board's (RWQCB) Non-degradation Policy, and Resource Conservation and Recovery Act (RCRA) Section 3020. The only option studied which involves reinjection is Option 4.

Any water reinjected on-site must meet all action-specific ARARs for reinjection. The reinjection must meet the "Statement of Policy With Respect to Maintaining High Quality of Waters in California," which requires that reinjected water not unreasonably degrade existing water quality. Nitrates are of concern with respect to reinjection; to avoid degradation, water from the Burbank OU treatment plant would have to be reinjected into an area of the aquifer containing as high or higher nitrate concentrations.

RCRA Section 3020 provides that the ban on the disposal of hazardous waste into a formation which contains an underground source of drinking water shall not apply to the injection of contaminated groundwater into the aquifer if: (i) such reinjection is part of a response action under CERCLA; (ii) such contaminated groundwater is treated to substantially reduce hazardous constituents prior to such reinjection; and (iii) such response action will, upon completion, be sufficient to protect human health and the environment.

Compliance with reinjection ARARs could be problematic for implementation of Option 4 due to high nitrate levels in the extracted and treated groundwater, and limited areas of the aquifer available for reinjection based on ARARs criteria.

Based on consideration of drinking water ARARs, Options 1, 2, and 3 are considered equivalent. Option 4 is considered less favorable than Options 1-3 due to potential difficulties in meeting reinjection ARARs.

2. Overall protection of human health and the environment

Options 1-4 are all protective of human health and the environment. In each case, direct threat of human contact with contaminated groundwater has been minimized. Extracted groundwater is being treated to meet drinking water standards before being served to the public. Therefore, the selection of any of the options for interim remedial action would result in no change in protection to human health and the environment from that achieved under the interim remedial action established in the ROD and ESD1.

Options 2-4 all inhibit the spreading of the VOC plume to downgradient wellfields, and along with federal and state source water monitoring requirements minimize the likelihood that contaminated water from downgradient wells would be served to the public. As far as the degree of overall containment is concerned, based on studies performed by CH2M Hill and Lockheed, EPA believes that protection of the aquifer is adequate under Options 2,3, and 4, and may be adequate under Option 1. This issue is discussed further in the section on long-term protectiveness below.

Options 1-4 all protect the environment from contact with contaminated groundwater. Under all four options, extracted groundwater is being treated and used as a public water supply and is not being discharged to the land surface. Option 4 differs from the other three options in that it requires reinjection of excess water. As long as reinjection ARARs are followed, Option 4 will not result in degradation of groundwater quality.

3. Short-term effectiveness in protecting human health and the environment

The analysis regarding short-term effectiveness of the Burbank OU interim remedy in protecting human health and the environment does not differ from the above analysis of overall protection of human health and the environment. Options 1-4 are all protective in the short-term. Phase of the Burbank OU project has already been constructed, and treated groundwater is being provided to the residents of the City of Burbank without negative impact; therefore, Option 1 would not produce additional short-term impacts.

Options 1-4 would require additional construction activity. The only potential additional short-term impact to human health and the environment would be limited to minor, standard, construction concerns such as exposure to wind-blown dust, and noise impacts. The well drilling activities necessitated under these three options would be limited to one to two months in duration, would produce very little airborne dust, and noise would be limited to daytime hours.

Option 2 would not produce any other short-term impacts. Options 3 and 4 would require an upgrade of the Burbank OU treatment plant, but this would consist of modifications to an existing plant and would not require significant excavation or earth moving activities, merely the addition or modification of existing physical components to the plant.

EPA believes any construction impacts would be minimal, and that Options 1-4 are all protective of human health and the environment in the short-term.

4. Long-term effectiveness and permanence in protecting human health and the environment

Options 1-4 would all maintain reliable protection of human health and the environment over time. Minor differences arise in the permanence of the various options. Since this is an interim remedial action, and the action itself is not considered permanent, permanence has not been considered a major factor in this evaluation.

However, in ranking the options with respect to permanence, EPA has evaluated to what degree they would contribute to aquifer restoration. Option 2 results in the greatest mass removal of PCE and TCE, suggesting that the combination of pumping rate and location of extraction wells is optimized under this alternative. The other options result in a similar degree of mass removal, with differences of only a few percent. This suggests that the 20 year period of groundwater extraction, which is not changed by the ESD, may be the controlling factor for mass removal. One unknown factor in this analysis is how much mass will continue to enter the groundwater system over the 20 year period of time. The final remedy will attempt to assess this effect and will attempt to address permanence in a more thorough analysis.

A comparison of mass removal for Options 1-4 over 20 years is presented below. These figures derive from an analysis performed by Lockheed Martin Corporation and reviewed by EPA, and EPA's consultant CH2M Hill. (See the Administrative Record: document entitled Evaluation of Extraction Scenarios for the BOU, dated March 20, 1995, prepared by Hydro-Search, Inc.) The comparison of percent removal uses as a baseline the Burbank OU groundwater plume as defined by the 5 ppb contour line. Percent removal refers to the percentage of the mass within the 5 ppb contour which is removed by the Burbank OU extraction wells over the 20 year projected length of the interim remedy.

As noted, the amount of mass removed is greater at a 9,000 gpm extraction rate (Option 2) than at a 12,000 gpm extraction rate (Option 4). This is due to the need to meet reinjection ARARs for nitrates under Option 4. The locations where reinjection wells may be placed to meet ARARs are not favorable for mass removal, because under Option 4, the treated water must be reinjected in an area close to the extraction wells. The reinjected water actually displaces and dilutes contaminated water such that overall removal efficiency for TCE and PCE decreases.

Table 1 - Mass Removal Over Twenty Years

	% mass PCE removed	% mass TCE removed
Option 1**1**	89	73
Option 2**2**	92	78
Option 3**3**	91	78
Option 4**4**	88	75

1 6,000 gpm pumping rate, no reinjection
2 9,000 gpm pumping rate, no reinjection
3 12,000 gpm pumping rate, no reinjection
4 12,000 gpm pumping rate, with reinjection

The only other long-term protectiveness issue relates to air emissions from the Burbank OU treatment plant. The off-gas from the plant's aeration towers contains TCE and PCE molecules which have been stripped from the groundwater. Although this off-gas is treated with the use of air-phase granular activated carbon, a small quantity of TCE and PCE (less than 1% of the total present in the off-gas) is released to the atmosphere at an elevation of approximately sixty feet above the ground surface. The South Coast Air Quality Management District has reviewed the emission levels and found them well within ARARs for air emissions. EPA believes that emissions from Options 1-4 will not negatively impact human health and the environment, due to the low

level of emissions, and due to their emission at a significant height above ground surface, away from people.

Nonetheless, Options 1-4 can be ranked in terms of overall emissions. The lower the groundwater extraction rate, the lower the rate of TCE and PCE removal, and the lower the rate of TCE and PCE emissions. Option 1 at a groundwater extraction rate of 6,000 gpm results in the least air emissions. Option 2 performs the next best in this respect. Options 3 and 4 result in slightly higher emissions.

5. Reduction of toxicity, mobility, and volume of contaminants

As stated above, EPA has evaluated to what degree the four options will contribute to mass removal. Mass removal of contaminants relates very closely to reduction in toxicity and volume of contaminants in the groundwater. Based on EPA's evaluation, all four options would result in similar degrees of reduction in toxicity and volume.

An assessment has also been made regarding the degree of hydraulic control Options 1-4 would exert over the groundwater contamination (Evaluation of Extraction Scenarios for the BOU, dated March 20, 1995, prepared by Hydro-Search). The degree of hydraulic control achieved relates very closely to reduction in mobility of the contaminants. The following comparison of hydraulic control is made based upon the groundwater plume as defined by the 5 ppb contour line (percent control refers to the percentage of the area within the 5 ppb contour which is contained, i.e. which does not move downgradient):

Table 2 - Hydraulic Control Over Twenty Years

	% control PCE	% control TCE
Option 1**5**	66	51
Option 2**6**	72	60
Option 3**7**	74	68
Option 4**8**	71	58

5 6,000 gpm pumping rate, no reinjection
6 9,000 gpm pumping rate, no reinjection
7 12,000 gpm pumping rate, no reinjection
8 12,000 gpm, pumping rate, with reinjection

Based on this analysis, Option 3 would result in the greatest reduction in mobility, particularly with respect to control of the TCE plume. Options 2, 3, and 4 control to a similar degree the PCE plume. Option 1 clearly results in a lesser degree of control. Option 3 turns out to be more efficient than Option 4, despite the fact that these options use the same pumping rate of 12,000 gpm, because based on current projections nitrate levels in the aquifer will not accommodate reinjection in hydraulically advantageous locations. A hydraulically advantageous location would be one where the reinjected water would assist in plume containment. ARARs requirements would restrict the placement of reinjection wells in areas where groundwater quality would not be degraded, meaning in areas where nitrates in groundwater are higher than nitrates in the water to be reinjected. If reinjected wells could be placed in the most hydraulically advantageous locations, Option 4 would be slightly superior to Option 3 in this regard.

When the interim remedial action is complete, EPA projects that contamination will remain in the groundwater under each of the four options. The final remedial action will determine how to address this remaining contamination.

Based on current data, Options 2 and 3 appear superior in terms of this criterion, but all options fulfill the goal of the ROD to partially control the movement and spread of groundwater contaminants in the Burbank OU area, while contributing to aquifer restoration.

6. Technical and administrative feasibility of implementation

The technical differences between the four options are as follows:

- Option 1 would require no additional construction. (Option 1 has already been implemented as Phase 1 of the interim remedy; therefore, it has been proven feasible.)

- Option 2 would require construction of 3,000 gpm of additional extraction wellfield capacity.

- Option 3 would require construction of 6,000 gpm of additional extraction wellfield capacity, plus a 3,000 gpm upgrade to treatment facility capacity.

- Option 4 would require construction of 6,000 gpm of additional extraction wellfield capacity, plus a 3,000 gpm upgrade to treatment facility capacity, plus construction of a 8,500 gpm reinjection wellfield.

In general, technical implementability increases in complexity as construction tasks are added to a project. Some construction tasks are more complex than others; for example, construction of a reinjection wellfield is more complicated than construction of an extraction wellfield due to more complex well specifications intended to reduce clogging of the well screens. Using this rationale, Option 4 is more complex than Option 3, which is more complex than Option 2, which is more complex than Option 1. As stated above, Option 1 has already been implemented technically (as well as administratively).

Ease of operation also factors into implementability. Application of proven technology generally reduces uncertainty of implementability, while application of a new technology increases uncertainty. Options 1, 2, and 3 all use common technology, while Option 4, by adding reinjection, uses a technology that has not been implemented widely in the geographic region of the Burbank OU.

Administratively, Options 1, 2, and 3, would be relatively simple because they would follow the framework developed during start-up of Phase 1 Burbank OU interim remedy. As part of Phase 1 start-up, EPA, the City of Burbank, Lockheed Martin Corporation, and DHS reached agreement on operational plans for the facility. Once again, Option 1, since it has been constructed and placed in operation, is not expected to present any administrative difficulties.

Construction of additional facilities, which would be necessary under Options 2, 3 and 4, would require amending the City of Burbank's public water supply operating permit, issued by DHS. Although this would be an additional administrative task, EPA is confident that additional permit conditions required by virtue of the addition of such facilities, would be achievable.

Option 3 would have the administrative complication of committing additional purveyors to accept water the City of Burbank could not accept. It is not likely that these additional purveyors would be willing to sign a consent decree, the chosen implementation document for the interim remedy. Lockheed Martin Corporation and the City of Burbank have both attempted, without success as of the date of this ESD2, to obtain the commitment of other local purveyors to accept Burbank OU water. Without this commitment, there is a good deal of uncertainty whether 12,000 gpm of groundwater could be purveyed on a routine basis, during periods when the City of Burbank could not accept the entire production of the Burbank OU facilities.

Option 4 would be more complicated to implement administratively due to the likely increased involvement of a regulatory agency, RWQCB, in the process. RWQCB has previously expressed reservations about reinjection based on water quality degradation concerns. However, EPA believes this additional administrative step would not present a barrier to implementation.

Based on technical and administrative considerations, Options 1 and 2 considered superior. Options 3 and 4 have administrative complications, which would need to be resolved prior to implementation. Option 3 may present a barrier to implementation while Option 4 probably does not.

7. Capital and operation and maintenance costs

The following discussion compares the costs of Options 1-4 on a net present value basis. Costs include construction and 20 years of operation and maintenance. These costs are not based on the original estimates set forth in the ROD and in ESD1, but are based on more recent estimates

prepared by a consultant to Lockheed Martin Corporation, the entity which has undertaken design and construction of the interim remedy under EPA oversight. (See the Administrative Record: document entitled Burbank Operable Unit Costs Comparison Summary, dated March 20, 1995, prepared by Parks, Palmer, Turner & Yemenidjian. These estimates were independently reviewed by CH2M Hill, EPA's ARCS contractor. Therefore, the actual cost of the Phase 1 Burbank OU treatment facilities constructed by Lockheed Martin, the City of Burbank, and six other businesses, has been incorporated into these estimates. CH2M Hill's analysis is presented in a memorandum entitled Review of Burbank Operable Unit Costs Comparison Summary, dated November 11, 1996. EPA has concluded that the cost estimates prepared by Lockheed Martin used appropriate assumptions and are therefore appropriate for purposes of comparison of alternatives.

Option 1 is the least expensive of the four options. The capital cost for this option is estimated at $31 million in 1996 dollars. The present value of the 20 years of operation and maintenance is estimated at $88 million. Therefore, the total net present value of Option 1 is estimated at $119 million. Economic assumptions used by Lockheed Martin's consultant in this analysis are as follows: a discount rate of 8% was used; an inflation rate of 3% was used; calculations are in 1995 dollars.

Option 2 more expensive than Option 1 but less expensive than Option 3. The capital cost for this option is estimated at $38 million in 1996 dollars. The present value of 20 years of operation and maintenance is estimated at $93 million. Therefore, the total net present value for Option 2 is estimated at $131 million.

Option 3 is more expensive than option 2 but less expensive than Option 4. The Capital cost for this option is estimated at $49 million in 1996 dollars. The present value of 20 years of operation and maintenance is estimated at $97 million Therefore, the total net present value for Option 3 is estimated at $146 million.

Option 4 is the most expensive of the four options. The capital cost for this option is estimated at $70 million in 1996 dollars. The present value of 20 years of operation and maintenance is estimated at $110 million. Therefore, the total net present value for Option 4 is estimated at $180 million.

For purposes of comparison, this information is set out in the following table:

Table 3 - Cost Comparison

Option	Capital	O&M	Total
1 **9**	$31 million	$ 88 million	$119 million
2**10**	$38 million	$ 93 million	$131 million
3**11**	$49 million	$ 97 million	$146 million
4**12**	$70 million	$110 million	$180 million

9 6,000 gpm pumping rate, no reinjection
10 9,000 gpm pumping rate, no reinjection
11 12,000 gpm pumping rate, no reinjection
12 12,000 gpm pumping rate, with reinjection

8. State acceptance

EPA has coordinated with state agencies throughout this project, specifically RWQCB, the California Department of Toxic Substances Control (DTSC), and DHS. These agencies either accepted, or did not object to, the interim remedy originally designated by the ROD and ESD1. The Administrative Record details the communications between EPA and these State agencies throughout the interim remedy selection process.

Regarding the remedy discussed in the ROD and ESD1, the record reflects that the RWQCB supports the use of the treated water as drinking water, provided that all requirements for the serving of public drinking are met. RWQCB agrees that reinjection may be implemented as long as compliance is achieved with respect to the "Statement of Policy With Respect to Maintaining High Quality Waters in California." (See the Administrative Record: letter dated June 8, 1990, from Hank Yacoub, RWQCB, to Alisa Greene, EPA; letter dated June 20, 1990, from Robert Ghirelli,

RWQCB, to Alisa Greene, EPA.)

The record reflects that neither DTSC nor DHS stated a preference or rejection of any of the options presented in the ROD and ESD1. (See the Administrative Record: letter dated May 15, 1990, from Hamid Saebfar, DTSC, to Alisa Greene, EPA, and letter dated June 11, 1990, from Gary Yamamoto, DHS to Alisa Greene, EPA.)

In addition to reviewing the Administrative Record through the ROD and ESD1, EPA notified the state agencies regarding the proposed changes which would be made by ESD2. Neither RWQCB nor DTSC provided written comments on the options presented in ESD2. However, as stated above, EPA also has presented EPA's position on the ESD2 options to the state and other agencies at quarterly Management Committee meetings. EPA's understanding based on exchanges with representatives from these agencies is that neither RWQCB nor DTSC objects to EPA's approach.

DHS did provide written comments on the changes proposed by ESD2, but did not state a preference for any of the options presented herein. (See the Administrative Record: letter dated September 6, 1996, from Gary Yamamoto, DHS, to David Seter, EPA.) DHS raised the issue that "limiting the pumping rate to a maximum of 9,000 gpm and the elimination of the re-injection option may limit U.S. EPA's future success in containing the contaminant plume." In response to this comment, EPA believes the analysis presented in this ESD2, in terms of the nine NCP criteria, thoroughly considers the impact of the various options including the impact on plume containment.

Specifically, the nitrate levels currently projected in the aquifer do not accommodate reinjection in hydraulically advantageous locations. The City of Burbank has already agreed to maximize its use of treated groundwater, which will be an average of 9,000 gpm. An extraction rate of 9,000 gpm without reinjection thus accomplishes better hydraulic control than an extraction rate of 12,000 gpm with reinjection.

9. Community acceptance

The basic groundwater extraction and treatment concepts being evaluated in ESD2 do not differ greatly from the concepts evaluated in the ROD and in ESD1. The same degree of treatment will be applied to water made available as a public water supply. During the thirty day comment period provided for by EPA during the development of ESD1, there were no comments submitted by the public.

In addition, EPA publish notice of availability of this ESD2 in a local newspaper of general circulation, and will consider any comments submitted by the public as required by 40 C.F.R. Section 300.825(c).

D. Decision on options

Based on the above analysis of Options 1-4, EPA has chosen Option 2, which consists of groundwater extraction at an average rate of 9,000 gpm, treatment by air stripping and granular activated carbon to remove VOCs, nitrate reduction by blending with a low nitrate water source, and use the treated and blended water by the City of Burbank as a public water supply.

Option 2 was chosen because:

1) it performs equally as well as Options 3 and 4 and better than Option 1 at removing contaminant mass over a 20 year period of time;
2) it performs substantially as well as Option 3 and better than Options 1 and 4 at retarding migration of the groundwater contamination plume;
3) its total implementation cost is:
    $15 million less than Option 3
    $49 million less than Option 4;
4) it avoids the potential administrative difficulties of Options 3 (identifying additional water purveyors) and 4 (resolving reinjection regulatory issues);
5) it complies with ARARs;
6) it is protective of human health and the environment.

This is an interim remedy. In the future, after the Burbank 0U facilities have been operational for a substantial period of time, the optimal extraction rate may be better determined. This

information will eventually factor into a decision on the final remedy. But for the purposes of ESD2, the data suggest that a groundwater extraction rate of 6,000 gpm may be too low to meet the groundwater containment objective. However, the data do not justify the added expense of raising pumping to a rate of 12,000 gpm. EPA has concluded that the Option 2 rate of 9,000 gpm is a reasonable, efficient, and cost-effective solution.

Although under ideal conditions pumping 12,000 gpm would provide greater containment than pumping 9,000 gpm, the reality of the ground water system as it exists in Burbank presents certain limitations. Under ideal conditions, nitrate levels would be low enough to meet ARARs reinjection requirements in areas determined to be hydraulically advantageous to reinjection. This is not the case, and is not likely to be the case throughout the time frame for implementation of the interim remedy. Because reinjection must take place in hydraulically disadvantageous locations, the effectiveness of Option 4 is lessened.

The Option 2 pumping rate is 9,000 gpm, which represents a 25% reduction in pumping versus Options 3 and 4. Yet, according to analysis performed by Lockheed Martin with which EPA concurs, Option 2 is superior containment to Option 4 and provides only slightly less containment than Option 3. **13** Furthermore, cost savings for Option 2 are significant (a savings of 27% versus Option 4).

Although additional cost savings are projected from further reducing the pumping rate to 6,000 gpm (Option 1), EPA believes that, should water levels increase in the aquifer system, capture could fall below acceptable levels under this option. As long as 9,000 gpm can be extracted and used without being wasted or reinjected, EPA concludes that Option 2 presents the best balance of reducing mobility of contaminants and cost-effectiveness.

As described above, EPA has also concluded that, for the purposes of long-term containment, groundwater extraction need not equal 9,000 gallons per minute each day. This is why EPA has set a goal of 9,000 gallons per minute as an annual average instead of an instantaneous average. EPA also believes its approach of allowing reduced groundwater extraction during periods of high nitrate concentration increases protectiveness to public health without adversely affecting long-term containment.

V. Support Agency Comments

The State of California agencies discussed in Section IV.C.8. above are the support agencies for this action. Their comments are addressed in that section.

VI. Summary of Selected Remedy

The interim remedy for the Burbank Operable Unit, as selected in the ROD and as modified by ESD1 and ESD2, consists of groundwater extraction at an average rate of 9,000 gpm, treatment by air stripping and granular activated carbon to remove VOCs, nitrate reduction by blending with a low nitrate water source, and use of the treated and blended water by the City of Burbank as a public water supply.

13 This comparison was based upon the degree of hydraulic control exerted by the various options on the TCE/PCE groundwater plume.

VII. Statutory Determinations

Considering the new information that has been developed, the EPA believes that the interim remedy as modified by ESD2 remains protective of human health and the environment, complies with federal and state requirements that are applicable or relevant and appropriate to this interim remedial action, and is cost effective. In addition, this remedy satisfies the statutory preference for remedies that employ treatment which permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances as a principal element. It also complies with the statutory preference for remedies that utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. The changes and clarifications contained in ESD2 are significant but do not fundamentally change the remedy. They do not change the decision to conduct an interim pump and treat action to inhibit the spreading of the contaminated groundwater plume and to begin aquifer restoration. They also do not alter the technologies used in the interim remedy.

VIII. Public Participation Activities

EPA has presented these changes to the remedy in the form of an Explanation of Significant Differences because the changes are of a significant, but not fundamental, nature. The basic groundwater extraction and treatment concepts being evaluated in ESD2 do not differ greatly from the concepts evaluated in the ROD, and in ESD1. ESD2 and underlying information have been added to the Burbank OU Administrative Record. Additional provisions for public comment are not required for an ESD (see 40 C.F.R. Section 300.435 (c)(2)(i)), and EPA is not providing a formal public comment period for ESD2. However, EPA has published notice of the availability of ESD2 in a local newspaper as required by 40 C.F.R. Section 300.435 (c)(2)(i)(B), and per 40 C.F.R. Section 300.825, will consider any significant comments submitted in a timely manner.